



US005173844A

United States Patent [19]

Adachi et al.

[11] Patent Number: **5,173,844**[45] Date of Patent: **Dec. 22, 1992**[54] **INTEGRATED CIRCUIT DEVICE HAVING A METAL SUBSTRATE**[75] Inventors: **Kohei Adachi; Mitsuyuki Takada; Atsushi Endo; Eishi Gofuku; Hayato Takasago**, all of Hyogo, Japan[73] Assignee: **Mitsubishi Denki Kabushiki Kaisha**, Tokyo, Japan[21] Appl. No.: **794,281**[22] Filed: **Nov. 19, 1991****Related U.S. Application Data**

[63] Continuation of Ser. No. 540,389, Jun. 19, 1990, Pat. No. 5,081,562, which is a continuation of Ser. No. 195,635, May 17, 1988.

[30] **Foreign Application Priority Data**

May 19, 1987 [JP]	Japan	62-74892
May 19, 1987 [JP]	Japan	62-74893
May 19, 1987 [JP]	Japan	62-74894

[51] Int. Cl.⁵ **H05K 7/20**[52] U.S. Cl. **361/414; 174/255; 361/388; 361/401**

[58] Field of Search 361/386, 387, 388, 401, 361/410, 414; 174/52.4, 251, 252, 255, 260; 428/901, 209; 357/80, 81

[56] **References Cited****U.S. PATENT DOCUMENTS**

2,923,860	2/1960	Miller	361/401
3,417,294	12/1968	Steidlitz	361/401
4,410,927	10/1983	Butt	361/401

4,544,989	10/1985	Nakabu	361/401
4,630,174	12/1986	Stenerson	361/386
4,731,700	3/1988	Woodward	361/401
4,737,395	4/1988	Mabuchi	428/209
4,755,417	7/1988	Detoma	428/209
4,796,157	1/1989	Ostrem	361/386
4,849,284	7/1989	Arthur	174/255
4,858,073	8/1989	Gregory	361/388

OTHER PUBLICATIONS

"Electronic Materials", Japan Digest, Oct. 1986, pp. 72-77.

ELECTRONIC MATERIALS: "Double-Sided Printed Circuit Board With Plated Through-Holes", by Takeshi Kano and Muhahiko Fukushima, Oct. 1986, pp. 72-77.

Primary Examiner—Gerald P. Tolin

Attorney, Agent, or Firm—Lowe, Price, LeBlanc & Becker

[57] **ABSTRACT**

A circuit board includes a copper plate and an insulating layer of photosensitive polyimide resin formed on the copper plate, the insulating layer leaving an exposed portion of a surface of the copper plate where an LSI is to be mounted. After Au plating is applied to the exposed surface of the copper plate, the LSI is mounted fixedly. A connection pattern having bonding pads is formed by copper plating on the insulating layer. The bonding pads and the LSI are connected by Au wire bonding on the Au plating applied on the bonding pads.

4 Claims, 5 Drawing Sheets